



DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R6–ES–2012–0003]

[4500030113]

Endangered and Threatened Wildlife and Plants; 90–Day Finding on a Petition to List the Eastern or Southern Rocky Mountain Population of the Boreal Toad as an Endangered or Threatened Distinct Population Segment

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of petition finding and initiation of status review.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), announce a 90–day finding on a petition to list either the Eastern population or the Southern Rocky Mountain (SRM) population of the boreal toad (*Anaxyrus boreas boreas*) as a distinct population segment (DPS) that is endangered or threatened under the Endangered Species Act of 1973, as amended (Act), and to designate critical habitat. Based on our review, we find

that the petition presents substantial scientific or commercial information indicating that listing the Eastern population of the boreal toad as a DPS may be warranted. We did not find substantial information that listing the SRM population of the boreal toad as a DPS may be warranted. Therefore, with the publication of this notice, we are initiating a review of the status of the Eastern population to determine if listing it as a DPS is warranted. To ensure that this status review is comprehensive, we are requesting scientific and commercial data and other information regarding the potential DPS. Based on the status review, we will issue a 12-month finding on the petition, which will address whether the petitioned action is warranted, as provided in the Act.

DATES: To allow us adequate time to conduct this review, we request that we receive information on or before **[INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**. The deadline for submitting an electronic comment using the Federal eRulemaking Portal (see **ADDRESSES** section, below) is 11:59 p.m. Eastern Time on this date. After **[INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**, you must submit information directly to the Field Office (see **FOR FURTHER INFORMATION CONTACT** section below). Please note that we might not be able to address or incorporate information that we receive after the above requested date.

ADDRESSES: You may submit information by one of the following methods:

(1) *Electronically:* Go to the Federal eRulemaking Portal:

<http://www.regulations.gov>. In the Enter Keyword or ID box, enter Docket No. **FWS–**

R6-ES-2012-0003, which is the docket number for this action. Then click on the Search button. You may submit a comment by clicking on “Send a Comment or Submission.”

(2) *By hard copy*: Submit by U.S. mail or hand-delivery to: Public Comments Processing, Attn: **FWS-R6-ES-2012-0003**; Division of Policy and Directives Management; U.S. Fish and Wildlife Service; 4401 N. Fairfax Drive, MS 2042-PDM; Arlington, VA 22203.

We will not accept e-mail or faxes. We will post all information we receive on <http://www.regulations.gov>. This generally means that we will post any personal information you provide us (see the **Request for Information** section below for more details).

FOR FURTHER INFORMATION CONTACT: Western Colorado Supervisor, Western Colorado Ecological Services Office, Grand Junction, CO; by telephone at 970-243-2778; or by facsimile at 970-245-6933. If you use a telecommunications device for the deaf (TDD), please call the Federal Information Relay Service (FIRS) at 800-877-8339.

SUPPLEMENTARY INFORMATION:

Request for Information

When we make a finding that a petition presents substantial information

indicating that listing a species may be warranted, we are required to promptly review the status of the species (status review). For the status review to be complete and based on the best available scientific and commercial information, we request information on the Eastern population of the boreal toad from governmental agencies, Native American tribes, the scientific community, industry, and any other interested parties. We seek information on:

(1) The species' biology, range, and population trends, including:

- (a) Habitat requirements for feeding, breeding, and sheltering;
- (b) Genetics and taxonomy;
- (c) Historical and current range including distribution patterns;
- (d) Historical and current population levels, and current and projected trends;
- and
- (e) Past and ongoing conservation measures for the species, its habitat or both.

(2) The factors that are the basis for making a listing determination for a species under section 4(a) of the Act (16 U.S.C. §§ 1531 *et seq.*), which are:

- (a) The present or threatened destruction, modification, or curtailment of its habitat or range;
- (b) Overutilization for commercial, recreational, scientific, or educational purposes;
- (c) Disease or predation;
- (d) The inadequacy of existing regulatory mechanisms; or
- (e) Other natural or manmade factors affecting its continued existence.

If, after the status review, we determine that listing the Eastern population of the boreal toad is warranted, we will propose critical habitat (see definition in section 3(5)(A) of the Act) under section 4 of the Act, to the maximum extent prudent and determinable at the time we propose to list the species. Therefore, we also request data and information on:

(1) What may constitute “physical or biological features essential to the conservation of the species,” within the geographical range currently occupied by the species;

(2) Where these features are currently found,

(3) Whether any of these features may require special management considerations or protection;

(4) Specific areas outside the geographical area occupied by the species that are “essential for the conservation of the species”; and

(5) What, if any, critical habitat you think we should propose for designation if the species is proposed for listing, and why such habitat meets the requirements of section 4 of the Act.

Please include sufficient information with your submission (such as scientific journal articles or other publications) to allow us to verify any scientific or commercial information you include.

Submissions merely stating support for or opposition to the action under

consideration without providing supporting information, although noted, will not be considered in making a determination. Section 4(b)(1)(A) of the Act directs that determinations as to whether any species is an endangered or threatened species must be made “solely on the basis of the best scientific and commercial data available.”

You may submit your information concerning this status review by one of the methods listed in the **ADDRESSES** section. If you submit information via <http://www.regulations.gov>, your entire submission—including any personal identifying information—will be posted on the website. If your submission is made via a hardcopy that includes personal identifying information, you may request at the top of your document that we withhold this personal identifying information from public review. However, we cannot guarantee that we will be able to do so. We will post all hardcopy submissions on <http://www.regulations.gov>.

Information and supporting documentation that we received and used in preparing this finding is available for you to review at <http://www.regulations.gov>, or by appointment, during normal business hours, at the U.S. Fish and Wildlife Service, Western Colorado Ecological Services Office (see **FOR FURTHER INFORMATION CONTACT**).

Background

Section 4(b)(3)(A) of the Act requires that we make a finding on whether a

petition to list, delist, or reclassify a species presents substantial scientific or commercial information indicating that the petitioned action may be warranted. We are to base this finding on information provided in the petition, supporting information submitted with the petition, and information otherwise available in our files. To the maximum extent practicable, we are to make this finding within 90 days of our receipt of the petition and publish our notice of the finding promptly in the **Federal Register**.

Our standard for substantial scientific or commercial information within the Code of Federal Regulations (CFR) with regard to a 90–day petition finding is “that amount of information that would lead a reasonable person to believe that the measure proposed in the petition may be warranted” (50 CFR § 424.14(b)). If we find that substantial scientific or commercial information was presented, we are required to promptly conduct a species status review, which we subsequently summarize in our 12–month finding.

Petition History

On May 25, 2011, we received a petition of the same date from the Center for Biological Diversity, the Center for Native Ecosystems, and the Biodiversity Conservation Alliance, requesting that either the Eastern or SRM population of the boreal toad be listed as an endangered or threatened DPS and that critical habitat be designated under the Act. The petitioners also requested that if boreal toads in either the Eastern or SRM population are designated as separate species during consideration of the petition (based on recent and ongoing genetic studies) that both species be listed under the Act.

We note the request to list either population as a DPS, or, if the two populations are found to be separate species, to list each as a separate species; however, there are currently no scientific papers calling for species designations for these two populations. Consequently, this 90–day finding examines only the possibility of listing the Eastern or SRM population as a DPS or two DPSs, and not the species question.

The petitioners included the requisite information in the petition, as required at 50 CFR § 424.14(a). In a June 23, 2011, letter to the petitioners, we responded that we reviewed the information presented in the petition and determined that issuing an emergency regulation temporarily listing the species as endangered under section 4(b)(7) of the Act was not warranted. We also stated that we would initiate response to the petition in Fiscal Year 2011 and would finalize a response in Fiscal Year 2012 (approximately March 2012). This finding addresses the petition.

Previous Federal Action(s)

On September 30, 1993, the Service received a petition from the Biodiversity Legal Foundation of Boulder, Colorado, and Dr. Peter Hovingh, a researcher at the University of Utah, Salt Lake City, Utah. The petitioners requested that the Service list the SRM population of the “western boreal toad” (a common name sometimes used in the past for *Anaxyrus boreas boreas*) as endangered throughout its range in northern New Mexico, Colorado, and southeastern Wyoming. The petitioners also requested that the Service designate critical habitat. We published a notice of a 90–day finding for the

petition in the **Federal Register** on July 22, 1994 (59 FR 37439), indicating that the petition and other readily available scientific and commercial information presented substantial information that the petitioned action may be warranted.

On March 23, 1995, the Service announced a 12-month finding that listing the SRM population of the boreal toad as an endangered DPS was warranted but precluded by other higher priority actions (60 FR 15281). At that time, a listing priority number of 3 was assigned. When we find that a species is warranted but precluded for listing, we refer to it as a candidate species. Section 4(b)(3)(B) of the Act directs that when we make a “warranted but precluded” finding on a petition, we are to treat the petition as being one that is resubmitted annually on the date of the finding; thus, the Act requires us to reassess the petitioned actions and to publish a finding on the resubmitted petition on an annual basis. Several resubmitted candidate assessments for the boreal toad were completed. The most recent assessment was published in the **Federal Register** on May 11, 2005 (70 FR 24870).

On October 7, 2002, as part of an agreement regarding multiple species, the U.S. Department of the Interior reached an out-of-court settlement with several conservation organizations and agreed to make a final determination for listing the SRM population of the boreal toad by no later than September 30, 2005. In the 2005 Annual Notice of Findings on Resubmitted Petitions, we noted that a determination for the boreal toad would be funded in Fiscal Year 2005 (70 FR 24870). On September 29, 2005, we reached a determination in the revised 12-month Finding that the SRM population of the

boreal toad did not warrant listing because it was not a listable entity according to the DPS criteria and, therefore, should be withdrawn from the candidate list (70 FR 56880). When the boreal toad was put on the candidate list in 1995, the DPS policy did not yet exist, so current criteria were not used to determine whether the toad was a listable entity. The combination of using the DPS criteria developed in 1996 and genetic and other information available during development of the 2005 finding led to determinations that the SRM population of the boreal toad was discrete based on DPS discreteness criteria but was not significant based on DPS significance criteria. Therefore, it was not considered a listable entity.

On September 2, 2008, we received a notice of intent to sue from the Center for Biological Diversity (dated August 28, 2008) for violations of the Act (i.e., failure to issue a proposed rule in 2005 or subsequently list the toad), but a lawsuit never followed.

Species Information

Taxonomy

The *Anaxyrus boreas* (formerly *Bufo boreas*) group of toads, of which the boreal toad is a subspecies, are amphibians that occur throughout much of the western United States. The species was first described from specimens collected on the Columbia River (Washington or Oregon) and Puget Sound (Washington) by Baird and Girard (1852).

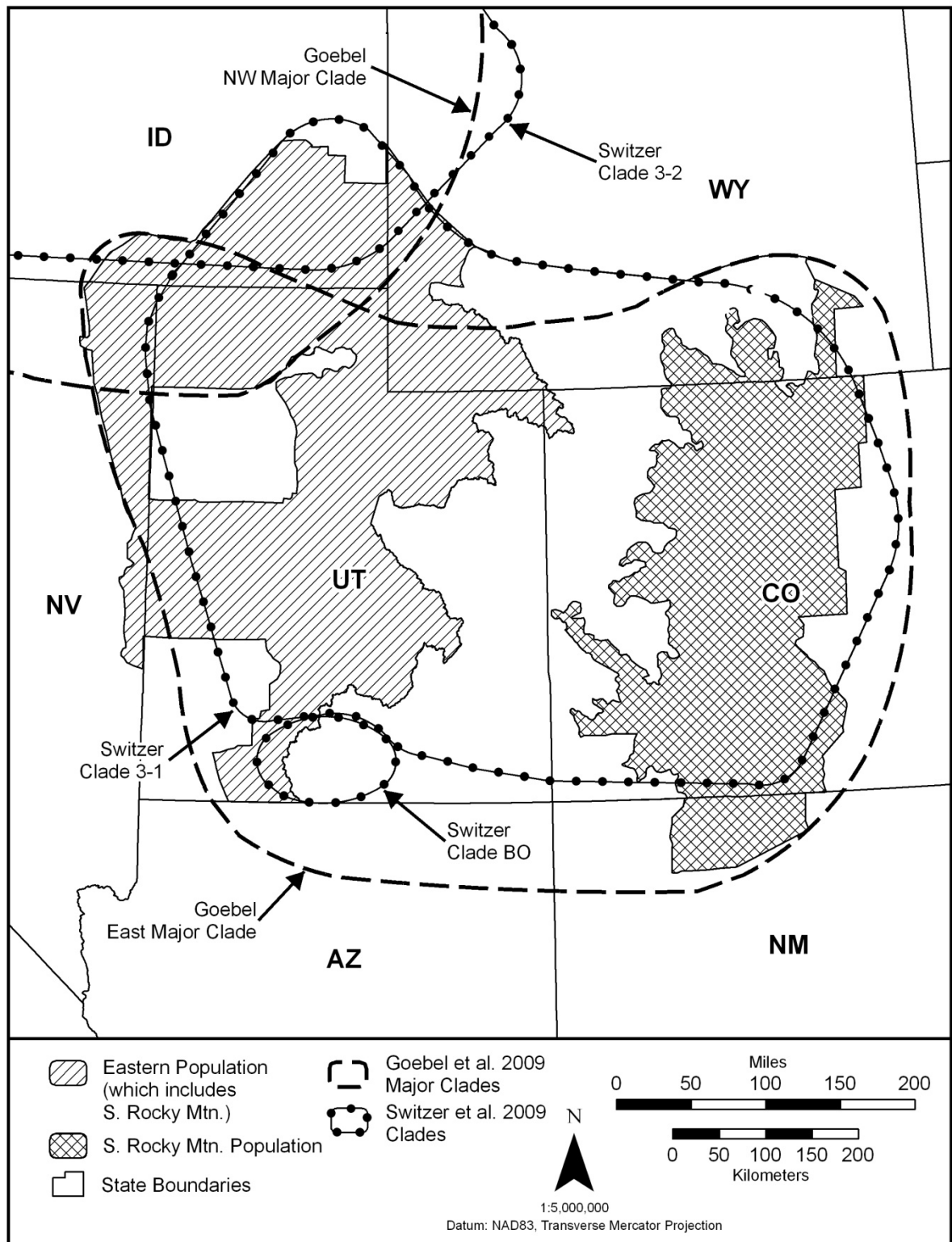
The genus for the boreal toad was revised from *Bufo* to *Anaxyrus* in 2006 (Frost *et al.* 2006, pp. 10, 213, 218, 222, 281, 329, 350, 363), and the Service accepts this revision.

Two subspecies of the boreal toad have been recognized for many years, the boreal toad (*A. b. boreas*, the subject of this finding) and the California toad (*A. b. halophilus*) (Camp 1917, p. 116). Other authors recognize up to four subspecies, with the Amargosa toad (*A. nelsoni* or *A. b. nelsoni*) and black toad (*A. exsul*) or (*A. b. exsul*) being the other two potential subspecies (Crother 2000 (2001), p. 7; 2008, pp. 2–4; Stebbins 2003, pp. 208-209, map 32). The Yosemite toad (*A. canorus*) also is considered to be a distinct but closely related species (Stebbins 2003, p. 210–211). All of the toad species and subspecies mentioned above are considered by Goebel *et al.* (2009, pp. 221, 223) and Switzer *et al.* (2009, pp. 25-26) to comprise the *A. boreas* group. Deoxyribonucleic acid (DNA) analyses by these two sets of authors suggest that a taxonomic change to the *A. boreas* group could be appropriate.

Two different studies analyzing mitochondrial DNA (mtDNA) from boreal toads and other closely related species and subspecies conclude that toads within the SRM population (southeastern Wyoming, Colorado, and New Mexico) and southwestern Wyoming, southeastern Idaho, northeastern Nevada, and Utah form a population of genetically similar toads termed the Eastern Major Clade (Goebel *et al.* 2009, p. 210, fig. 1) or Clade 3–1 (Switzer *et al.* 2009, p. 8). The combination of these two clades (populations of genetically similar toads), the Eastern Major Clade and Clade 3–1, primarily form the Eastern population (see the map in this notice). Switzer *et al.* (2009,

fig. 3) also identify a smaller clade (named Clade BO by Switzer *et al.*) based on a distinct haplotype in southern Utah that constitutes a small part of the Eastern population (see the map in this Federal Register notice). Also examined within this finding are boreal toads found within the part of the Northwest Major Clade that overlaps with the Eastern Major Clade (Goebel 2003, p. 2; Goebel *et al.* 2009, p. 210, fig. 1). This overlap is further supported by Switzer *et al.* (2009, fig. 3), who found that the area they designated as Clade 3–2 overlaps with Clade 3–1 (see the map in this notice). Clade 3–2 is a weakly supported clade that, in combination with Clade 3-3 and sister Clade 3-4, constitutes the larger Clade 4-1 discussed in Switzer *et al.* (2009, pp. 9-10, fig. 2).

The Northwest Major Clade extends from western Wyoming and northwestern Utah over to west-central California and up to southeastern Alaska, including ranges of both the boreal toad and the California toad (Goebel *et al.* 2009, p. 215). The Eastern Major Clade extends from central Colorado to northeastern Nevada, and from southern Wyoming to northern New Mexico and Arizona (see the map in this notice). All of the toads within the Eastern Major Clade and overlap area of the Northwest Major Clade (or Clades 3–1 and 3–2) are considered to be boreal toads (Goebel *et al.* 2009, p. 215; Switzer *et al.* 2009, p. 3) (see the map in this notice).



Map. The Eastern population and southern Rocky Mountain subset of the Eastern population.

As illustrated in the map in this notice, the combination of the outermost extent of both 2009 genetic articles' clade boundaries primarily form the boundaries of the Eastern population. Two exceptions occur in west-central Utah and eastern Nevada, where the Eastern population boundary extends beyond the clade boundaries (see map). The petitioners based the Eastern population boundaries on gross range maps drawn by the International Union for Conservation of Nature, creating the two exceptions. Reduction in size of the Eastern population from clade boundaries also occurs in Arizona, northwestern New Mexico, and the other States, based on lack of habitat and no records of boreal toads ever occurring in the excluded areas (see map).

Portions of Goebel *et al.*'s (2009, p. 210, fig. 1) Northwest Major Clade and Switzer *et al.*'s (2009, fig. 3) Clade 3-2 are illustrated in the map in this notice, and discussed in the "Evaluation of Listable Entities" section below, because of their geographic and genetic overlap with the Eastern Major Clade and Clade 3-1 and their necessary consideration in making a determination on whether the Eastern population is a listable entity. The other petitioned entity, the SRM population of the boreal toad, is a subset of the Eastern population (see map).

Biology

Boreal toads may reach a length (snout to vent) of 12.7 centimeters (5 inches) (Hammerson 1999, p. 90; Stebbins 2003, p. 208). They possess warty skin, oval parotoid glands, and often have a distinctive light mid-dorsal stripe. During the breeding season,

males develop a dark patch on the inner surface of the innermost digit. Unlike many other toad species, the boreal toad has no vocal sac and, therefore, produces no mating call (Hammerson 1999, p. 90). Tadpoles are black or dark brown.

Boreal toads in the SRM population typically occupy habitat at elevations between 2,440 meters (m) (8,000 feet (ft)) and 3,350 m (11,000 ft) (Loeffler 2001, p. 6). However, within the Eastern population, they have been recorded as low as 1,570 m (5,150 ft) and as high as 3,661 m (12,000 ft) (Livo and Yeakley 1997, p. 143; Thompson *et al.* 2004, p. 256; Hogrefe *et al.* 2005, p. 7). Boreal toads occurring further north and west from the SRM population occupy lower elevations and are found down to sea level on the Pacific coast (Stebbins 2003, p. 209). At higher elevations, adult boreal toads emerge from winter refugia when snowmelt has cleared an opening from their burrows and daily temperatures remain above freezing (Campbell 1970a, pp. 22, 99; Campbell 1970b, p. 281). Breeding can occur from late January to July, depending on latitude, elevation, and local conditions (Stebbins 2003, p. 209). Breeding occurs during a 2- to 4-week period from mid-May to mid-June at lower elevations, and as late as mid-July at higher elevations in the SRM population (Hammerson 1999, p. 96). Suitable breeding sites are large bodies of water or small pools, beaver ponds, glacial kettle ponds, roadside ditches, human-made ponds, and slow-moving streams (Campbell 1970a, pp. 24–25; Hammerson 1999, p. 95).

Boreal toads have been observed to lay up to 16,500 eggs (Campbell 1970a, p. 24), and, in Colorado they have been observed laying up to 10,900 eggs (Hammerson

1999, p. 96), with an overall mean clutch size of 6,661 eggs (Carey *et al.* 2005, p. 224).

The eggs are black and are deposited in long double-layer jelly strings, with one to three rows of eggs (Hammerson 1999, p. 90). Eggs hatch 1 to 2 weeks after being laid. Egg and tadpole development is temperature-dependent, and reproductive efforts may fail if tadpoles do not have sufficient time to metamorphose before the onset of winter.

Persistent, shallow bodies of water are critical to breeding success, and if the breeding site dries before metamorphosis is complete, desiccation of the tadpoles or eggs will occur. Tadpoles typically metamorphose by late July to late August, but at higher elevations metamorphosis may not be complete until late September (Loeffler 2001, p. 7). Recently metamorphosed toadlets (metamorphs) aggregate within a few meters of the water and move into nearby moist habitats later in summer.

After mating, adults often disperse to upland, terrestrial habitats, where they are mostly active during the day in early and late summer (Mullally 1958, entire; Campbell 1970a, pp. 84-86; Carey 1978, pp. 203, 206, 211), foraging primarily on ants, beetles, spiders, and other invertebrates (Schonberger 1945, p. 121; Campbell 1970a, p. 69-71). Late in the summer the toads will expand their home ranges, generally in the direction of wintering habitats, which include cavities among streamside boulders, ground squirrel burrows, and beaver lodges and dams (Campbell 1970a, pp. 50, 87; Hammerson 1999, p. 94).

Survival of embryos from laying to hatching is normally high, but catastrophic mortality has been observed (Blaustein and Olson 1991, entire). Survival of tadpoles and

juveniles is low, with predation and adverse environmental conditions primarily responsible for mortality at these life stages (Campbell 1970a, p. 61). Between 95 and 99 percent of juveniles die before reaching their second year of life (Samollow 1980, p. 33). The minimum age of breeding boreal toads is about 4 years in males and 6 years in females (Hammerson 1999, p. 97). Females may skip 1 to 3 years between breeding attempts, and individuals may live approximately 11 or 12 years (Olson 1991, pp. 7, 14).

Distribution, Abundance, and Trends

The range of the boreal toad subspecies (*Anaxyrus boreas boreas*) extends from coastal Alaska south and east through the Yukon Territory, the extreme southwest corner of the Northwest Territory, British Columbia, western Alberta, Washington, Oregon, northern California, northern Nevada, Idaho, western Montana, western and southeastern Wyoming, central and northern Utah, central to western Colorado, and extreme north-central New Mexico (Stebbins 2003, map 32; Goebel *et al.* 2009, p 210). No records of the boreal toad exist from Arizona or northwestern New Mexico, and, therefore, we do not consider the range of the boreal toad to include Arizona or northwestern New Mexico.

The range of the SRM population includes southeastern Wyoming through the mountainous region of central to west-central Colorado, and into extreme north-central New Mexico. The range of the Eastern population encompasses the SRM population and also includes southwestern Wyoming, southeastern Idaho, northeastern Nevada, and Utah

(Goebel *et al.* 2009, p. 210; Switzer *et al.* 2009, p. 8, figure 3; Greenwald *et al.* 2011, pp. 17, 56–72) (see the map in this notice).

SRM Population

Southeastern Wyoming

In southeastern Wyoming, the boreal toad was once widespread and numerous in the Medicine Bow, Pole, Snowy, and Sierra Madre Mountain Ranges (Baxter and Stone 1985, p. 31; Keinath and Bennett 2000, p. 4). Declines in populations were documented in southeastern Wyoming from 1986 through 1988 (Corn *et al.* 1989, pp. iv, 26), and the subspecies is now rare in southeastern Wyoming (Keinath and Bennett 2000, p. 4; Jackson 2008, p. 4). Distribution, abundance, and trends of SRM toads are based on field monitoring from 1997 through 2011, but the latest written report ends with the 2007 field season (Jackson 2008, entire). In 2003, toads were observed in only seven southeastern Wyoming locations (in Albany and Carbon Counties). Only one breeding population is known to occur in southeastern Wyoming (Jackson 2008, pp. 91–92; Colorado Division of Wildlife 2010, p. 1). However, this population does not meet the population viability criteria established in the SRM conservation plan that was written by the State-led Boreal Toad Recovery Team (composition of Team described in Factor D) (Loeffler 2001, p. 17–18). The viability criteria specify the number of adults required at a breeding site, the frequency of breeding activity, and the amount of egg production and recruitment needed to maintain a viable population. The criteria also specify that a viable population must

face no known significant and imminent threats to its habitat, health, or environmental conditions.

Colorado

In Colorado, the boreal toad was historically known to occur in 25 counties, and was common throughout the higher elevations (Burger and Bragg 1947, pp. 61–62; Smith *et al.* 1965, p. 5; Keinath and McGee 2005, p. 22), except for the Sangre de Cristo Mountains, Wet Mountains, and Pikes Peak region (Hammerson 1999, p. 90). Disappearances of 11 populations in the West Elk Mountains were documented between 1974 and 1982 (Carey 1993, pp. 357-358). Surveys of 59 historically occupied localities in Colorado between 1986 and 1988 failed to find individuals in 83 percent (49 locations) of the sites (Corn *et al.* 1989, p. iv). Surveys conducted in 1989 (249 locations) and 1991 (377 locations) in suitable habitat and historical locations resulted in finding boreal toads at 2 and 1 location, respectively (Hammerson 1989, pp. 41, 46, 50, 52, 53; Hammerson 1992, pp. 2, 142). The number of known breeding populations increased from 1996 to 2007, from the high teens to mid-40s; however, the number of individuals in some breeding populations have declined significantly from large numbers in the late 1990s or early 2000s to relatively few individuals as of 2007. Many more breeding sites and breeding populations have had very few toads observed since their initial discovery (Jackson 2008, pp. 12–91, 94). Despite knowledge of increased numbers of locations of boreal toads, the Boreal Toad Recovery Team identified only one population meeting the SRM conservation plan definition of viable in 2006 and 2007, versus a high of six

populations in 1999 (Loeffler 2001, p. 17–18; Jackson 2008, p. 11). The lower number of viable populations is primarily due to detection of chytrid fungus (*Batrachochytrium dendrobatidis*), hereafter abbreviated “Bd,” a threat suspected in decline of boreal toad numbers and distribution (Jackson 2008, pp. 6, 10). The above information suggests boreal toad populations are declining in Colorado.

New Mexico

The boreal toad was known to occur in three Rio Arriba County, New Mexico, localities: Lagunitas, Canjilon, and Trout Lakes (Campbell and Degenhardt 1971, entire; Jones 1978, p. 3; New Mexico Department of Game and Fish (NMDGF) 1988, p. 1; Degenhardt *et al.* 1996, p. 49). Declines were first documented in New Mexico in the mid–1980s (Woodward and Mitchell 1985, p. 5; Carey 1987, pp. 1, 3). Surveys in 1993 revealed no populations at the three previously known locations (Stuart and Painter 1994, p. 115). No boreal toads were observed during surveys of the Trout Lakes and Lagunitas areas of New Mexico in 2004 (Jackson 2005, p. 41). Consequently, in 2008 a repatriation program was started at Trout Lakes with over 4,000 Colorado-reared tadpoles being released (NMDGF 2008, p. 2; USFWS 2009, p. 3). In 2009, over 3,400 tadpoles were released at Trout Lakes (NMDGF 2010, p. 4–5; USFWS 2010, p. 3). In 2009, only seven boreal toads from the 2008 release were recaptured (NMDGF 2010, p. 3).

In summary, based on currently available data, the distribution and abundance of boreal toads in the SRM population appears to be declining.

Eastern Population, excluding the SRM portion of the Population (see above)

Southwestern Wyoming

Relatively recent records (1993–2003) and historical records (pre-1993) of boreal toad locations were compiled for southwestern Wyoming (McGee and Keinath 2004, pp. 65–66). Historically, boreal toads occurred in Uinta and Lincoln Counties in the southwestern corner and west-central edge of Wyoming. One (nonbreeding) record from far eastern Lincoln County was recorded in the 1993–2003 time period. Other recent records in the region are from Sublette County bordering the eastern side of Lincoln County. Juvenile or recently metamorphosed toads and tadpoles were collected in Sublette County, Wyoming, for genetic analysis. The most southerly of the three toad samples was grouped with the Eastern population by Goebel (2003, p. 7). We do not have more recent distribution or status information in our files for southwestern Wyoming.

Southeastern Idaho

Two genetic sample sites in southeastern Idaho occur within the Eastern population (Switzer *et al.* 2009, fig. 3 and table 8). We do not currently have additional information on boreal toad distribution or status in southeastern Idaho.

Northeastern Nevada

One boreal toad genetic sample has been collected in northeastern Nevada (Goebel *et al.* 2009, pp. 210 and 212). We currently have no additional information on the distribution or status of boreal toads in northeastern Nevada.

Utah

The petition states that boreal toads are largely distributed throughout most of their historical range in Utah, which includes northern and central Utah (referencing Thompson *et al.* 2004, entire). Toads were considered to be irregularly distributed, and not all historical areas were occupied at the time of the Utah Boreal Toad Conservation Plan's development (Hogrefe *et al.* 2005, p. 5). The Utah Conservation Plan states that between 1995 and 2004, toads were recorded at a minimum of 102 localities (Hogrefe *et al.* 2005, p. 5), and eight populations were considered viable (Hogrefe *et al.* 2005, p. 1). Ten populations in 2009 were considered viable according to the definition in the Utah Conservation Plan (Utah Division of Wildlife Resources (UDWR) 2010, pp. I–16, I–17, II–10, III–5, IV–12).

In summary, based on currently available data, the number of viable populations appears stable in Utah, but little information exists to evaluate the current distribution or trend in abundance in the Eastern population outside of the boundaries of the SRM population.

Evaluation of Listable Entities

Under section 3(16) of the Act, we may consider for listing any species, including subspecies, of fish, wildlife, or plants, or any DPS of vertebrate fish or wildlife that interbreeds when mature (16 U.S.C. 1532(16)). Such entities are considered eligible for listing under the Act (and, therefore, are referred to as listable entities) if we determine that they meet the definition of an endangered or threatened species. The petitioners have requested that either the SRM population of the boreal toad or the Eastern population of the boreal toad be considered a DPS and listed as endangered or threatened under the Act.

Distinct Vertebrate Population Segment

In determining whether an entity constitutes a DPS, and is therefore listable under the Act, we follow the Policy Regarding the Recognition of Distinct Vertebrate Population Segments Under the Endangered Species Act (DPS Policy) (61 FR 4722; February 7, 1996). Under our DPS Policy, we analyze three elements prior to listing a possible DPS: (1) The discreteness of the population segment in relation to the remainder of the taxon; (2) the significance of the population segment to the taxon to which it belongs; and (3) the population segment's conservation status in relation to the Act's standards for listing (e.g., is the population segment, when treated as if it were a species, endangered or threatened?) (61 FR 4722). This finding considers whether the petitioned SRM population or Eastern population of the boreal toad may be a DPS.

Discreteness

Under our DPS Policy, a population segment of a vertebrate species may be considered discrete if it satisfies either one of the following conditions: (1) It is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors (quantitative measures of genetic or morphological discontinuity may provide evidence of this separation); or (2) it is delimited by international governmental boundaries within which significant differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist (61 FR 4722).

Significance

Under our DPS Policy, in addition to our consideration that a population segment is discrete, we consider its biological and ecological significance to the taxon to which it belongs. This consideration may include, but is not limited to, the following:

- (1) Evidence of the persistence of the discrete population segment in an ecological setting that is unusual or unique for the taxon;
- (2) Evidence that loss of the discrete population segment would result in a significant gap in the range of a taxon;

(3) Evidence that the discrete population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historical range; or

(4) Evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics (61 FR 4722).

Discreteness Information Provided in the Petition

The petition cites two genetic studies (Goebel *et al.* 2009, entire; Switzer *et al.* 2009, entire) that the petitioners believe support either that (1) the Eastern population, which would include the SRM population, is markedly separate from other boreal toad populations because of genetic differences and geographic separation, or (2) the SRM population is markedly separate from the rest of the Eastern population, as well as all other boreal toad populations, due to geographic separation. The petitioners recognize there may be overlap in genetics and geography between the Eastern and SRM populations, as well as with other populations within the range of the species, but they believe that the level of overlap is within the bounds allowed by the DPS policy in that the DPS policy does not “require absolute reproductive isolation as a prerequisite to recognizing a distinct population segment” (61 FR 4722).

Significance Information Provided in the Petition

The petition states that both the Eastern population and SRM population occur in an unusual or unique ecological setting. The petition also states that a significant gap in the range could occur if boreal toads are extirpated from either the Eastern population (a 20 percent (or 161,422 square miles) loss of the species' range in the conterminous United States) or SRM population (a 5 percent (or 38,894 square miles) loss of the species' range in the conterminous United States). Furthermore, the petition states that the Eastern population is significant based on Goebel *et al.* (2009, entire) and Switzer *et al.* (2009, entire). The petition further states that evidence shows that the SRM population may be significant based on the potential for the SRM population to be its own evolutionary unit as evidenced by geographic separation and greater diversity than currently recognized species (Goebel *et al.* 2009, pp. 213, 221).

Evaluation of Information Provided in the Petition and Available in Service Files on Discreteness of the SRM Population

Based on evidence of feasible dispersal distances, the SRM population is likely geographically (physically) separated from other populations of the boreal toad, including the western portion of the Eastern population (Keinath and McGee 2005, p. 16, fig. 7 and pp. 26–27) (see the map in this notice). The greatest recorded distance of movement for a boreal toad in the southern Rocky Mountains is 8 kilometers (km) (5 miles (mi)) (Lambert 2003, p. 88). The map in this notice illustrates the gross range of the western part of the Eastern population and the SRM population. We used complete hydrologic units to develop the eastern boundary of the western part of the Eastern population. The

petition maps did not use complete hydrologic units, particularly in northeastern Utah, but rather cut them off at State boundaries. The Red Desert separates these two portions of the Eastern population in Wyoming by about 126 km (78 mi), and arid habitat in western Colorado and eastern Utah create separation of at least 84 km (52 mi). However, boreal toads are not known to actually occupy the outer extent (lower elevations) of the gross hydrologic units in the map in this notice. Maps in the petition can be referred to in order to see hydrologic units known to be occupied by boreal toads (Greenwald *et al.* 2011, pp. 56–72). Looking at these hydrologic unit of occurrences, and based on relatively current ranges described in Keinath and McGee (2005, p. 16, fig. 7), approximately 210 km (130 mi) of separation occurs in Wyoming. At least 200 km (125 mi) of separation occurs in eastern Utah and western Colorado (Greenwald *et al.* 2011, pp. 9, 56–72). Therefore, the large size and arid, inhospitable habitat of the Red Desert and arid lands to the south in Colorado and Utah likely create a geographic barrier to migrating toads.

Mitochondrial DNA analysis indicates that the SRM population is part of a more widespread evolutionary lineage that includes boreal toad populations from Utah, northeastern Nevada, southeastern Idaho, and southwestern Wyoming (Goebel *et al.* 2009; Switzer *et al.* 2009). However, since mtDNA evolves slowly, taxonomic separation based solely on mtDNA may not provide clear taxonomic distinctions. For example, a single haplotype from boreal toads in the Uinta Mountains of Utah also occurs in boreal toads in the SRM population (Goebel *et al.* 2009, p. 221). Discovery of this haplotype common to both areas led to the combination of the SRM population and the

Uinta Mountain site as a minor clade—that clade is named the Eastern Rocky Mountain Minor Clade (Goebel *et al.* 2009, p. 217, figure 4). However, due to the long distance separating the sites, the occurrence of this haplotype in both areas may be a result of incomplete lineage sorting commonly found in recently isolated groups (Goebel *et al.* 2009, p. 221). In other words, boreal toads from the Uinta Mountain site and the SRM population may have interbred at one time thousands to millions of years ago, but are not likely to have interbred since then, and the similar haplotype detection is simply a feature of the slow evolutionary changes that can occur in portions of mtDNA. These statements lend support to the idea that the geographic separation of the SRM population has eliminated genetic interbreeding and the SRM population is discrete. However, further DNA (particularly nuclear DNA (nDNA)) studies are needed to provide clarification on taxonomy, before genetic evidence could be used to support genetic discreteness of the SRM population.

Nonetheless, based on its current geographic separation from other boreal toad populations, we believe there is substantial information to indicate that the SRM population may meet the DPS Policy definition of discreteness.

Evaluation of Information Provided in the Petition and Available in Service Files on Discreteness for the Eastern Population (which includes the SRM population)

As referenced above, two different studies analyzing mtDNA from boreal toads and other closely related species and subspecies conclude that toads within the SRM

population and southwestern Wyoming, southeastern Idaho, northeastern Nevada, and Utah form a population of genetically similar toads termed the Eastern Major Clade (Goebel *et al.* 2009, p. 210, fig. 1) or Clade 3–1 (Switzer *et al.* 2009, p. 8, and fig. 3), which we refer to in this document as the Eastern population of the boreal toad (see the map in this notice). Both studies acknowledge that the Eastern population overlaps with areas identified as the Northwestern Major Clade (Goebel *et al.* 2009, p. 210, fig. 1) or Clade 3–2 (Switzer *et al.* 2009, fig. 3) (see the map in this notice). Therefore, absolute reproductive isolation may not currently be occurring between the Eastern population and other populations of boreal toads. However, studies suggest that the Eastern Major Clade and the Northwestern Major Clade are sufficiently different that they may represent different species (Goebel 2003 p. 7). There is a need to examine additional nDNA further north in Wyoming, in the Yellowstone area and surrounding regions, to determine if nDNA divergence parallels mtDNA divergence in boreal toads (Goebel 2003, p. 8).

Through mtDNA analysis, Goebel (2003, pp. 8–9) found greater differences between boreal toads in the Eastern Major Clade versus the Northwest Major Clade than mtDNA differences found between the Canadian toad (*Bufo hemiophrys*) and American toad (*B. americanus*), which are considered to be two separate species. Goebel *et al.* (2009, p. 15) provides further support for genetic differences, identifying the Eastern and Northwest Major Clades of boreal toads as having different haplotype groups. This mtDNA separation suggests the Eastern population of boreal toads may be a distinct species (or subspecies) from toads in the Northwest Major Clade or other taxonomic entities of boreal toads to the north and west. Haplotypes found through mtDNA analysis

and microsatellite DNA analysis are differentiated enough between Clade 3–1 (corresponding to the Eastern population) and Clade 3–2 to the north that Switzer *et al.* (2009, p. 8, 23, 25) hypothesized Clade 3–1 could be its own taxonomic entity.

The petition states that the Snake River Plain in Idaho geographically separates the boreal toad populations. Boreal toads might not cross the Snake River Plain itself; however, based on genetic samples, it does not appear that the Plain is a genetic barrier (Switzer *et al.* 2009, fig 3). Genetic samples from Clade 3–2 (Switzer *et al.* 2009, fig. 3) and the Northwest Major Clade (Goebel *et al.* 2009, p. 210, fig. 1) occur north and south of the Plain, which suggests boreal toad gene flow around the Snake River Plain. The petition erroneously states that the Hell’s Canyon portion of the Snake River separates boreal toads along the Idaho–Wyoming border. Although the upper end of the Snake River does occur on the Idaho–Wyoming border, Hell’s Canyon is on the Idaho–Oregon border.

The petition also states that gene flow may occur to the west of the northeastern Nevada site where samples were obtained by Goebel *et al.* (2009, pp. 210, 212). However, the petition cites Noles (2010, entire), who reviewed and studied genetic and historical geologic processes (phylogeography) to explain distribution of boreal toad clades in Nevada. The study identifies some genetic sample sites and clade names for boreal toads in Nevada and states that it is reasonable to suspect that boreal toads in the Bonneville Basin are discernible from boreal toads in the Relict Dace Basin and the Lahontan Basin immediately to the west (Noles 2010, pp. 24, 50, 51). These statements

lend support to the idea that the western edge of the Bonneville Basin is the northwesternmost extension of the Eastern population, as asserted by the petition. However, limited boreal toad genetic sampling in the Bonneville Basin, Relict Dace Basin, Lahontan Basin, and an unnamed basin on the northern border of Nevada make the genetic overlap issue unclear in western Utah, northern Nevada, southwestern Idaho, and eastern Oregon (Noles 2010, pp. 12, 38, 39, 50, 51).

Based on genetic data, there appears to be a continuum of boreal toad distribution from southeastern Idaho into western Wyoming and all the way to Alaska, as well as a continuum from northwestern Utah, northern Nevada, southwestern Idaho, and eastern Oregon all the way to Alaska (Goebel *et al.* 2009, p. 210, 217; Switzer *et al.* 2009, figure 3). However, the DPS policy allows for some overlap of interbreeding and states that animals do not “require absolute reproductive isolation as a prerequisite to recognizing a distinct population segment” and that “recognized species... are known to sustain a low frequency of interbreeding with related species” (61 FR 4722). Furthermore, as the DPS Policy explains, discreteness “does not require absolute separation of a DPS from other members of its species, because this can rarely be demonstrated in nature for any population of organisms. This standard [adopted by the DPS Policy] is believed to allow entities recognized under the Act to be identified without requiring an unreasonably rigid test of distinctness” (61 FR 4722). Consequently, based primarily on mtDNA genetic evidence and phylogeographic evidence, we find that the petition and our files contain substantial information that the Eastern population of the boreal toad may be discrete,

despite some genetic and geographic overlap with other boreal toad populations. We will further examine this information during the status review for the 12-month finding.

Evaluation of Information Provided in the Petition and Available in Service Files on Significance for the SRM Population

Unusual or Unique Ecological Setting

The petition asserts that boreal toads in the SRM population could be significant based on unusual or unique ecological settings as described in a map of ecoregions (areas with common vegetation, soils, geology, precipitation levels, hydrology, etc.) (U.S. Environmental Protection Agency (EPA) 2011, entire). The petitioners assert that ecoregions in the SRM population are distinct from ecoregions in the Eastern population, as well as distinct from ecoregions in other areas occupied by the boreal toad. For the purposes of determining significance in a DPS analysis, we look at whether the ecological settings occupied in the area under consideration are unique or unusual to the taxon in question, not whether the setting is unique from other settings. The petitioner did not provide substantial information to indicate that the geographic area occupied by the SRM population is unique or unusual for the boreal toad taxon, as required by the DPS policy. Additionally, we found no information in our files that these settings were unique to the SRM population of the boreal toad.

The petition referenced a study that indicates that boreal toads may occur at lower

elevations in Utah than in the SRM population (Hogrefe *et al.* 2005, p. 7). However, there is still overlap in elevational range of occupied habitats between boreal toads in the SRM population and in Utah; therefore, elevation does not appear to differentiate a unique ecological setting for boreal toads in the SRM population. Also, the petition notes that the ecoregions have varying (but overlapping) levels of precipitation and vary in dominant vegetation types, but again, specific habitats that boreal toads actually occupy (for example, mesic subalpine habitats) appear similar across all ecoregions. Consequently, there is not substantial evidence in the petition or in our files to support unusual or unique ecological settings as a significant factor in differentiating the SRM population from the western part of the Eastern population or from other areas throughout the range of the boreal toad.

Significant Gap in Range

The petition states the SRM population constitutes about 5 percent (or 38,894 square miles) of the range in the conterminous United States and that its loss could pose a significant gap in the range of the boreal toad. This loss, which would occur at the southeastern edge of the range, would create a gap in the range of the boreal toad in the conterminous United States. However, we do not believe this gap would be significant, due to the combination of the area being on the edge of the range and covering a relatively small area. We do not believe there is substantial information that the loss of SRM would be significant to the taxon.

Marked Differences in Genetic Characteristics

The petition suggests that boreal toads in the SRM population are significant under the DPS Policy because they comprise more diversity than currently recognized species, such as in the Canadian toad and American toad example used above by Goebel *et al.* (2009, p. 215). However, in order to be considered significant under the DPS criteria, it is not important how diverse the population is, but rather whether that diversity (e.g., that of haplotypes) differs markedly from other populations of boreal toads. Also, although Goebel *et al.*'s (2009, p. 221) statement about incomplete lineage sorting may prove accurate, we do not find there is currently enough genetic data to support the statement. Goebel *et al.* (2009, p. 15) conclude that the SRM population shares haplotypes with boreal toads in the western part of the Eastern Major Clade. Switzer *et al.* (2009, p. 26) also conclude that boreal toads within the SRM population share haplotypes with boreal toads in the western portion of Clade 3–1. In fact, both studies group boreal toads in the SRM population genetically with other toads in the Eastern population, concluding that they are part of a more widespread evolutionary lineage. Consequently, we find that current genetic analyses do not provide substantial information that the SRM population may be significant, because the SRM population does not have markedly different genes compared to the rest of the Eastern population.

Evaluation of Information Provided in the Petition and Available in Service Files on Significance for the Eastern Population

Unusual or Unique Ecological Setting

The petition asserts that boreal toads in the Eastern population could be significant based on unusual or unique ecological settings as described in a map of ecoregions (EPA 2011, entire). They assert that ecoregions in the Eastern population are distinct from other ecoregions outside of the Eastern population. For the purposes of determining significance in a DPS analysis, we look at whether the settings occupied in the area under consideration are unique or unusual to the taxon in question, not whether the setting is unique from other settings. We do not agree with the petition's assertion that ecoregions in the Eastern population are unique. Some areas within the range of the taxon may in fact be unique because of elevation, precipitation levels, and vegetative characteristics. However, we find that many of the ecoregions, and areas actually occupied by the boreal toad within the range of the taxon, are similar enough that the Eastern population cannot be characterized as unusual or unique (i.e., they occupy relatively high elevation, moist, subalpine, or boreal forest habitat). Consequently, there is not substantial evidence in the petition or in our files to support unusual or unique ecological settings as a significant factor in differentiating the Eastern population from other areas throughout the range of the boreal toad taxon.

Significant Gap in Range

The petition states the Eastern population (which includes the SRM population) constitutes approximately 20 percent of the subspecies' range in the conterminous United

States and that this should be considered a significant gap in the range should boreal toads in the Eastern population become extirpated. Based on a review of the information in the petition and available in our files, there appears to be sufficient information to indicate that there may be a significant gap in the range of the species if the Eastern population were lost. We will further investigate this in our 12-month status review.

Marked Differences in Genetic Characteristics

For the Eastern population, two studies suggest through mtDNA analysis that the combination of the clades that make up the Eastern population of the boreal toad could be considered a separate species or subspecies. These hypotheses are based on different haplotypes between the clades that make up the Eastern population (Eastern Major and Clade 3–1) and the clades to its north (Northwest Major and Clade 3–2) (Goebel *et al.* 2009, pp. 215, 223; Switzer *et al.* 2009, pp. 18–26). A phylogeographic study in Nevada also suggests that boreal toads in the Bonneville Basin could be distinct from toads further to the west in Nevada, thereby supporting the idea that the Eastern population is a genetically distinct population (Noles 2010, pp. 24, 50, 51). Based on information provided in the petition and in our files on differing haplotypes between the Eastern population and clades to the north, we find that the Eastern population of boreal toad may be significant.

DPS Determination for the SRM Population

For the reasons described above, we determine that there is not substantial information in the petition and in our files to suggest that the SRM population of boreal toads may be a valid listable entity (DPS). Although this population appears geographically discrete, we did not find substantial information to suggest that it may be significant according to the standard in our DPS Policy. Therefore, we will not evaluate the status of this population further in this finding.

DPS Determination for the Eastern Population

Based on current knowledge from genetic studies and distribution information, there appears to be some genetic and geographic overlap of the Eastern population with populations of boreal toads to the north of the Eastern population. However, some genetic and geographic overlap is allowed by the DPS Policy, and we have determined that the extent of this overlap may be within the bounds of the DPS Policy. Therefore, considering information in the petition and readily available in our files, we find there is substantial information that the Eastern population of boreal toads may be a valid DPS based on sufficient genetic and geographic discreteness from the other boreal toad populations, and based on evidence of significance, including the significant gap in the range of the boreal toad that would be created if the Eastern population should become extirpated. In addition, marked (significant) genetic haplotype differences between the Eastern population and other populations of boreal toads to the north also support our determination that there is substantial information that the Eastern population may be a valid listable entity (DPS). We will further analyze the validity of this potential DPS

with respect to our DPS policy during the 12-month finding.

Evaluation of Information for this Finding

Section 4 of the Act (16 U.S.C. § 1533) and its implementing regulations at 50 CFR § 424 set forth the procedures for adding a species to, or removing a species from, the Federal Lists of Endangered and Threatened Wildlife and Plants. A species may be determined to be an endangered or threatened species due to one or more of the five factors described in section 4(a)(1) of the Act:

(A) The present or threatened destruction, modification, or curtailment of its habitat or range;

(B) Overutilization for commercial, recreational, scientific, or educational purposes;

(C) Disease or predation;

(D) The inadequacy of existing regulatory mechanisms; or

(E) Other natural or manmade factors affecting its continued existence.

In considering what factors might constitute threats, we must look beyond the mere exposure of the species to the factor to determine whether the species responds to the factor in a way that causes actual impacts to the species. If there is exposure to a factor, but no response, or only a positive response, that factor is not a threat. If there is exposure and the species responds negatively, the factor may be a threat and we then attempt to determine how significant a threat it is. If the threat is significant, it may drive

or contribute to the risk of extinction of the species such that the species may warrant listing as threatened or endangered as those terms are defined by the Act. This does not necessarily require empirical proof of a threat. The combination of exposure and some corroborating evidence of how the species is likely impacted could suffice. The mere identification of factors that could impact a species negatively may not be sufficient to compel a finding that listing may be warranted. The information shall contain evidence sufficient to suggest that these factors may be operative threats that act on the species to the point that the species may meet the definition of threatened or endangered under the Act.

In making this 90-day finding, we evaluated whether information regarding threats to the Eastern population of the boreal toad, as presented in the petition and other information available in our files, is substantial, thereby indicating that the petitioned action may be warranted. Our evaluation of this information is presented below.

A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range.

Information Provided in the Petition

The petition states that water management, roads, livestock grazing, recreation, timber harvest, residential and commercial development, pollutants, and energy and minerals management are all activities that destroy, modify, or curtail the boreal toad's

habitat or range. The petitioners believe that any of these activities could contribute to the decline of the boreal toad.

Water Management – The petition cites several studies to show that water management can lead to direct habitat loss, habitat fragmentation, and detrimental alteration of natural hydrological regimes, through a number of activities, including draining or filling of wetlands, water diversion for municipal or agricultural purposes, dam and reservoir construction, dewatering of habitats, bank stabilization, and stream channelization (Loeffler 2001, p. 12 ; McGee and Keinath 2004, p. 37; Hogrefe *et al.* 2005, p. 19; Stoddard *et al.* 2005, p. 6). The petition also states that extended hydroperiods of wetlands can increase densities of invertebrate predators and establishment of predatory fishes (Scott 1996, pp. 45–46; Skelly 1996, pp. 599–604).

Roads – The petition states that roads cause habitat fragmentation, prevent migration, cause mortality, and alter water flow that sustains aquatic habitats (Lehtinen *et al.* 1999, p. 2; Loeffler 2001, p. 12; Hogrefe *et al.* 2005 p. 17). The petition also states that amphibians in general are particularly vulnerable to road mortality. The petition states that other detrimental factors may include pollutants, erosion and sedimentation, vibrations, and noise. The petition cites several additional studies to support these claims, but these references were not provided to us or readily available in our files. One article and one personal communication referenced in the petition state that several boreal toad mortalities have been observed, but other references either do not provide specific information or appear to be general and would not provide information specific to the

boreal toad.

Livestock Grazing – The petition states that livestock trample boreal toads and their habitat. Trampling of habitat could cause further mortality to boreal toads from loss of vegetative cover resulting in desiccation (Bartelt 2000, p. 98; Hogrefe *et al.* 2005, p. 15). The petition also provides information to suggest that livestock grazing may cause declines in water quality from excess nutrients, reduction in vegetation that helps filter water, and reduced survival of eggs and tadpoles from increased siltation, water temperatures, and fecal contamination (Loeffler 1998, p. 54; McGee and Keinath 2004, p. 33–34; Hogrefe *et al.* 2005, p. 15). The petitioners argue that insect abundance (toad prey) also may be reduced by livestock grazing (Fleischner 1994, pp. 631–632). The petitioners state that prairie-dog or other rodent control programs for livestock management reduce availability of burrows for overwintering toads (Sharps and Uresk 1990, pp. 339–345). The petition also suggests that compaction of soils may potentially limit the availability of burrows that help prevent desiccation and freezing of toads, that overutilization of tall herbaceous cover may make adult toads more susceptible to predation, and that grazing contributes to a decline in beaver populations that may, in turn, result in less boreal toad habitat. The petitioners did not provide references to support most of the above claims, and we do not have data readily available in our files to support such claims.

Recreation – Recreation is cited in the petition as impacting amphibians through loss of eggs, tadpoles, metamorphs, and adults due to trampling, vehicle impacts, habitat

degradation, an increase in predators attracted to human refuse, and transfer of pathogens between boreal toad populations (Hogrefe *et al.* 2005, p. 17). The petition states that human handling and pet-related mortality of boreal toads also may occur. The petition provides examples of where some of these activities have impacted boreal toads, and cites references that were not available to us in our files.

Timber Harvest – The petition states timber harvest may cause (1) mortality through crushing by equipment, (2) interruption of dispersal from breeding sites, or of late-summer dispersal of adults into uplands, (3) soil compaction that limits the availability of burrows used for overwintering hibernacula, (4) a reduction of available refugia through burning of slash piles and downed woody materials, (5) sedimentation that could disturb habitat, and (6) the spread of nuisance species. The petition states that any timber harvest activity that affects wetlands could have negative impacts to the boreal toad (Loeffler 1998, p. 56–57; Bartelt 2000, pp. 20–27, 74–77; McGee and Keinath 2004, pp. 32–33). However, only one of the references available to us on this topic was specific to the species, showing that effects to boreal toads from interruption of dispersal by timber harvest have been documented (Bartelt 2000, pp. 20–27, 74–77).

Residential and Commercial Development – The petition states that residential and commercial development have potentially caused extirpation of boreal toads in several areas in Utah and Colorado (Thompson *et al.* 2004, p. 257).

Pollutants – The petition states that pollutants including herbicides, insecticides,

and piscicides are harmful to amphibians (Loeffler 2001, p. 13; Hayes *et al.* 2002, pp. 5476-5479). The petition also states that high salinity concentrations may affect toad equilibrium and that a high proportion of streams in the range of the Eastern population of boreal toad have high salinity (Dole *et al.* 1985, pp. 645–648; Stoddard *et al.* 2005, p. 40).

Energy and Minerals Management – The petition states that energy and minerals management causes habitat loss and fragmentation from new roads, well pads, pumps and other facilities, and utility lines, and an increase in human presence from vehicle traffic and construction activity (U.S. Bureau of Land Management (BLM) 2005, pp. 3–29).

Evaluation of Information Provided in the Petition and Available in Service Files

Water Management – Alteration of natural hydrology and hydrologic processes, such as removal of water sources, shortening or lengthening water availability, and flooding large areas of habitat or dispersal corridors could cause impacts to the boreal toad (Loeffler 2001, p. 12; Hogrefe *et al.* 2005, p. 19). It is possible that extended hydroperiods of water bodies could increase densities of invertebrate predators and allow establishment of predatory fishes. It also is possible that water manipulation could decrease rates of boreal toad reproduction and recruitment (Scott 1996, pp. 45-46; Skelly 1996, pp. 599-604; Semlitsch 2002, pp. 621-623; McGee and Keinath 2004, p. 37). The creation of Lefthand Reservoir in Boulder County, Colorado, flooded a large wetland, forcing boreal toads to its margins where habitat may not have been as suitable

(Campbell 1970a, p. 7; Hammerson 1999, p. 92). Reservoirs may not have suitable shallow water for breeding, and open water replaces foraging habitat around previously existing wetlands (Hammerson 1999, p. 92). However, the information in the petition and in our files did not provide any substantial information or analyses to suggest that these effects are occurring in a widespread basis in the Eastern population of boreal toads.

The petition states that a substantial proportion of streams located within the range of the Eastern population of boreal toads have been impacted by disturbance, and cites a study illustrating an average 30-40 percent disturbance of stream corridor riparian areas, about 10 percent disturbance of riparian vegetation, and 10-20 percent disturbance of streambed stability by stressors in the Southern Rockies and Northern Rockies ecoregions (Stoddard 2005, p. 40, fig. 15). The stream corridor riparian area category does indicate a moderate amount of disturbance to potential boreal toad habitat loss and fragmentation. However, the number and extent of streams in this study that were occupied by boreal toads is unknown, so the extent of impact is indeterminable.

The petitioners state that wetland losses have occurred throughout Utah and are expected to continue due to human population growth (Lee 2001, p. 4). There are numerous wetlands and water sources within the range of the boreal toad that have not been impacted, but there has been alteration of riparian and wetland habitat and hydroperiods due to water development and use. We believe this issue is the most likely activity under Factor A to cause impacts to the boreal toad. However, the petition and the

information in our files does not detail the extent of wetland or riparian habitat alteration as it corresponds to effects on boreal toad habitat. The petition does not provide an analysis of water management impacts to boreal toads. Consequently, we find that localized impacts from water management activities may occur, but the petition and information in our files does not present substantial scientific or commercial information indicating that water management activities are a threat for the Eastern population of the boreal toad.

Roads – Roads could cause direct mortality by vehicle strike as well as direct loss of habitat, fragmentation, sedimentation, and alteration of hydrology, and could potentially limit dispersal and gene flow (Lehtinen *et al.* 1999, pp. 1–12; Loeffler 2001, p. 12; Hogrefe *et al.* 2005, p. 17). However, while the petitioners mapped major roads in the range of the boreal toad, they provided limited specific evidence of road impacts to boreal toad populations (Hogrefe 2005, p. 17; Greenwald *et al.* 2011, pp. 26, 72). The references referred to by the petition as supporting impacts from roads were general in nature and did not speak directly to the boreal toad or its habitat. Although there are some heavily traveled roads in or near boreal toad habitat, the majority of roads are less-traveled dirt roads that we do not believe cause a high level of mortality or other impacts to boreal toads. We find that localized impacts from roads may occur but the petition and information in our files does not present substantial scientific or commercial information indicating that roads may threaten the Eastern population of the boreal toad.

Livestock Grazing – Livestock grazing can occasionally cause direct mortality to boreal toads (Bartelt and Peterson 1996, p. 14; Bartelt 2000, p. 98; Hogrefe *et al.* 2005, p. 15). Additionally, grazing can cause boreal toad habitat destruction and degradation through eating and trampling of vegetation and possible water quality reduction through bank erosion and water contamination (Fleischner 1994, pp. 631–632; Loeffler 1998, p. 54; Bartelt 2000, pp. 98, 20–27, 74–77; McGee and Keinath 2004, pp. 33–34; Hogrefe *et al.* 2005, p. 15). Clear-cutting (removal of all trees in an area) has been shown to adversely affect boreal toads by creating open spaces that are too dry (and presumably too cold at night) for toads (Bartelt 2000, pp. 20–27, 74–77). If livestock are removing vegetation in large areas, adverse conditions similar to those resulting from clear-cuts could occur. However, the references in the petition and additional references in our files (Bartelt and Peterson 1996, entire) only mention occasional direct effects to the boreal toad and only the possibility of widespread habitat threats. We find that localized impacts from grazing may occur, but the petition and information in our files do not present substantial scientific or commercial information indicating that grazing may be a threat to the Eastern population of boreal toad.

Recreation – Recreation from camping, hiking, biking, fishing, and off-highway vehicle use could impact boreal toad habitat and bring increased predation and the chance of pathogen introduction (Loeffler 1998, p. 51). Potential effects from these activities include transfer of disease, including Bd, into uninfected habitats, along with trampling, loss of vegetation, reduced water quality, and loss of habitat (Hogrefe *et al.* 2005, pp. 15, 17). Human activities around boreal toad breeding sites could increase the presence of

ravens and jays, which could increase predation on boreal toads. However, we are not aware of studies that specifically researched effects of recreation on boreal toads. We find that localized impacts from recreation may occur, but the petition and information in our files do not present substantial scientific or commercial information indicating that recreation may be a threat to the Eastern population of boreal toad.

Timber Harvest – Timber harvest activities, especially clear-cuts, can have detrimental effects to the boreal toad by interrupting dispersal corridors, causing sedimentation of streams, causing impacts to wetland and riparian vegetation used by toads, and affecting habitat by prescribed burning of slash piles or downed woody material (Bartelt and Peterson 1994, pp. 18–19; Loeffler 1998, pp. 56–57; Bartelt 2000, pp. 20–27, 74–77; McGee and Keinath 2004, pp. 32–33). Timber harvest equipment can cause direct mortality and compaction of soils that reduce burrow availability for shelter or overwintering (Loeffler 1998, pp. 56–57; McGee and Keinath 2004, pp. 32–33). Although local impacts to habitat may occur from slash pile or downed woody material burning in timber harvest areas, prescribed burning or wildfires can promote longevity of wetland areas that boreal toads need by preventing build-up of vegetation and subsequent succession to other habitat types (Russell *et al.* 1999, pp. 374–384). We find that localized impacts from timber harvest activities may occur, but the petition and information in our files does not present substantial scientific or commercial information indicating that timber harvest activities occur frequently enough that they may be a threat to the Eastern population of boreal toad.

Residential and Commercial Development – Some boreal toad habitat loss could be attributed to development on the Wasatch Front between Salt Lake City and Provo, Utah; rapid population growth in this area has likely contributed to boreal toad habitat impacts and possible extirpations (Lee 2001, p. 4; Thompson 2004, p. 257). Ski areas and associated residential development in Colorado also were identified in the petition as causing habitat loss or degradation. The petition did not cite any references on the effects of ski areas, but an article on home ranges of boreal toads documents the potential impacts of ski area development by mentioning ski area proximity and related county setbacks in Summit County, Colorado (Muths 2003, p. 163). Ski area development and associated housing have likely impacted localized areas, but boreal toads currently face little threat from residential and commercial development due to the higher elevation habitat they occupy. We find that localized impacts from residential and commercial development may occur, but the petition and information in our files do not present substantial scientific or commercial information indicating that residential or commercial development may be a threat to the Eastern population of boreal toad.

Pollutants – There are observations and studies describing potential impacts to the boreal toad from mine runoff and acidification (Porter and Hakanson 1976, pp. 327–331; Corn *et al.* 1989, entire; Corn and Vertucci 1992, entire; Loeffler 1999, pp. 31–32; Jackson 2006, pp. 58–59). However, impacts are likely localized. Although it was hypothesized that a short-term acidic pulse from snowmelt could produce effects to amphibians, acidification was not found to be a factor in regional amphibian declines in the Rocky Mountains (Corn and Vertucci 1992, p. 367). Another study demonstrated that

pH would have to be below 4.9 to produce negative effects to boreal toad embryo survival, but pH in the elevations common for boreal toad occurrence is typically between 7 and 6 (Corn *et al.* 1989, pp. 19, 20, 28). Therefore, information in the petition and in our files suggests that localized impacts from pollutants may occur, but there is not substantial information to demonstrate that the impacts are pervasive enough that they may be a threat to the Eastern population of the boreal toad.

Studies have illustrated the effects of pesticides and herbicides on amphibians, and deposition by drift can occur (Berrill *et al.* 1994, p. 663; Hayes *et al.* 2002, pp. 5476-5479; Fellers *et al.* 2004, p. 2176; Relyea 2005, p. 626). However, to our knowledge there is limited application of pesticides or herbicides in or near boreal toad habitat. Forest management activities such as fire retardant drops are infrequent, and piscicide application also is infrequent. In addition, we do not agree with the petitioners that a high proportion of streams in the range of the Eastern population of the boreal toad have high salinity levels (Stoddard 2005, p. 40, fig. 15). In fact, we believe they misinterpreted information in their reference source, because ecoregion locations (described in the reference) where boreal toads primarily occur (Southern Rockies, Northern Rockies, and Northern Xeric Basins) have very low salinity (Stoddard 2005, p. 40, fig. 15). Salinity from road salts could impact localized breeding sites, but we expect the occurrence of these impacts is rare across the range and would likely occur along heavily traveled roads only. Overall, we find that localized impacts from pollutants may occur, but the petition and information in our files do not present substantial scientific or commercial

information indicating that pollutants may be a threat to the Eastern population of boreal toad.

Energy and Minerals Management – Energy and mineral development can cause habitat loss and fragmentation from roads, utility lines, and other facilities, and can increase human presence in mining areas. As the petition points out, hardrock mines in Colorado may impact boreal toads, but boreal toads continued to inhabit the Urad/Henderson Mine in large numbers until Bd arrived there in 1999 (Loeffler 1999, p. 31–32; Jackson 2006, p. 27, 58–59). In fact, there is speculation that Bd-infected boreal toads at the Urad/Henderson Mine may have had better survival from the infection due to inhabiting water with mine effluent than boreal toads not inhabiting waters in the effluent area (Jackson 2006, p. 58-59). Mining may increase human presence in boreal toad habitat and some mortality may occur from vehicles or people, but with the general decline in hardrock mining activity over the last several decades, we believe the risk of mortality from mining-related activities is low.

We also are not aware that oil and gas development is a widespread activity in boreal toad habitat. In Colorado, where extensive oil and gas development has occurred, an extremely small amount of oil and gas development occurs in boreal toad habitat and the majority of boreal toad habitat is located in areas that have low to no potential for oil and gas development (Gunnison Sage-grouse Rangewide Steering Committee 2005, p. 130; Colorado Greater Sage-grouse Steering Committee 2008, p. 112). We find that localized impacts from energy and minerals management may occur, but the petition and

information in our files do not present substantial scientific or commercial information indicating that energy and minerals management may be a threat to the Eastern population of the boreal toad.

Summary for Factor A

Based on the information provided in the petition, as well as other information readily available in our files, we find that the petition does not present substantial scientific or commercial information indicating that the Eastern population of the boreal toad may warrant listing due to the present or threatened destruction, modification, or curtailment of the species' habitat or range. Although each of the issues evaluated under Factor A may impact the Eastern population of the boreal toad locally, the information in the petition and in our files does not indicate that these rise to the level of a threat to the population. There is no information presented in the petition or contained in our files that the threats described under Factor A cumulatively threaten the Eastern population of the boreal toad. However, we will evaluate this factor and cumulative effects of the threats described under this factor more thoroughly during the 12-month status review if we determine that a valid DPS of boreal toad exists.

B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes.

The petition states there is little information on the extent of boreal toad collection or harvesting (McGee and Keinath 2004, p. 37). Some boreal toads, eggs, or tadpoles

have been collected by universities, State wildlife agencies, zoos, and other institutions for propagation, translocation, genetic research or other scientific study, or educational purposes. However, information in our files shows that entities involved in these activities in the SRM population area have developed protocols to avoid or minimize mortality or injury to boreal toads (Scherff–Norris 1997, entire; Loeffler 2001, pp. 36–53). Additionally, the Utah Conservation Plan provides general procedures to minimize impact of collection activities and outlines plans for development of protocols (Hogrefe *et al.* 2005, pp. 28–38). Due to collection and handling procedures implemented by these entities, and the lack of known collection pressure from the public, we do not consider overutilization of the boreal toad to be occurring. Based on our evaluation, neither the petition nor information in our files presents substantial scientific or commercial information to indicate that overutilization for commercial, recreational, scientific, or educational purposes may present a threat to the Eastern population of the boreal toad such that the petitioned action may be warranted. However, we will evaluate this factor more thoroughly during the 12–month status review if we determine that a valid DPS of boreal toad exists.

C. Disease or Predation.

Information Provided in the Petition

Disease – The petition states that the chytrid fungus (Bd) is the primary pathogen of concern for the Eastern population of the boreal toad (Fellers *et al.* 2001, pp. 945, 952;

McGee and Keinath 2004, p. 23–24; Hogrefe *et al.* 2005, p. 13). The petition states that Bd attacks the skin of boreal toads and can cause chytridiomycosis (the disease that can result from Bd infection), resulting in 90-100 percent mortality (McGee and Keinath 2004, p. 43–44). The exact mechanism of mortality caused by Bd infection is not understood, but possible mechanisms include disruption of water, oxygen, and ion exchange and secretion of toxins from the Bd associated with chytridiomycosis (Berger *et al.* 1998, p. 9036).

The petition also claims that red-leg disease (*Aeromonas hydrophila*), a fungus called *Saprolegnia ferax*, and a trematode (*Ribeiroia ondatrae*) have all been documented to cause mortality or malformations in amphibians and also could impact the Eastern population of boreal toads (Johnson *et al.* 2001, pp. 370–379; Kiesecker *et al.* 2001, entire; Hogrefe *et al.* 2005, p. 14). The petition states that nonnative species, such as bullfrogs (*Rana catesbeiana*) and certain species of fish, may impact the boreal toad by transmitting pathogens, including Bd and *Saprolegnia ferax* (Kiesecker *et al.* 2001, p. 1069; Schloegel *et al.* 2010, p. 53).

Predation – The petition states that, despite boreal toad adults’ having toxic skin secretions, boreal toads have many native predators that are suspected of depressing toad populations (Arnold and Wassersug 1978, entire; Flier *et al.* 1980, entire; Beiswenger 1981, entire; Brodie and Formanowicz 1987, entire; Olson 1989, entire). The petition states that nonnative predators, such as trout or bullfrogs, also may reduce populations of boreal toads (Bahls 1992, pp. 183, 191; McGee and Keinath 2004, p. 38–39).

Evaluation of Information Provided in the Petition and Available in Service Files

Disease – Bd was first identified in the late 1990s from a captive blue poison dart frog (*Dendrobatis azureus*) (Longcore *et al.* 1999, entire). Since then, Bd has been reported in numerous species of amphibians worldwide and is most likely a recent introduction to North America (Berger *et al.* 1999, p. 29; Lips *et al.* 2003, entire). However, Bd has been present since at least the early 1970s in America. A specimen from Colorado preserved in 1974 was tested for Bd and was found to have the fungus present (Hogrefe *et al.* 2005, p. 14). As stated above, Bd attacks the skin of boreal toads and may cause chytridiomycosis, which can result in serious disruption of cutaneous respiration and osmoregulation (Berger *et al.* 1998, p. 9036).

Boreal toads on the Paunsaugunt Plateau in southern Utah were reported to be infected with Bd in 2005, and chytridiomycosis is the suspected cause of boreal toad mortalities in this population (Hogrefe *et al.* 2005, pp. 14, 26). The Paunsaugunt Plateau (represented by up to seven sites comprising one or two breeding populations) was the only area out of six areas in the UDWR's Southern Region that was positive for Bd infection as of 2009 (UDWR 2010, pp. III–3). The Paunsaugunt Plateau had only one adult toad observed in 2009 at one out of seven sites monitored on the Plateau, although a couple of other sites on the Paunsaugunt Plateau had tadpoles observed (UDWR 2010, pp. III–3, 5). The low number of toads suggests that Bd has affected toads on the Paunsaugunt Plateau.

In 2008, 77 Bd swabs (DNA samples taken for analysis of Bd presence or absence) were taken from boreal toads at Strawberry Reservoir in the Central Region of the Utah Division of Wildlife Resources, with 38 of those samples (49 percent) testing positive for Bd (UDWR 2010, p. II–4). In 2009, 105 toads were detected at 3 sites at Strawberry Reservoir; however, the impacts of Bd on boreal toad recent population trends are uncertain (UDWR 2010, pp. II–3, II–10). In the Northeast Region of the UDWR, only 1 of 27 Bd swabs taken in 2008 tested positive for Bd (UDWR 2010, p. IV–4). Although some swabs are positive for Bd infection, Bd test results among regions in Utah are variable, and it is unknown whether or not Bd is causing declines in boreal toad populations there. However, it is clear that the infection is present across Utah.

Surveyors and researchers in the SRM population collected 417 samples from 46 sites across Colorado in 2003, and subsequent analysis detected 33 toads at 8 sites with Bd (Jungwirth, 2004, p. 53). It also was discovered from the study that, at sites with Bd, adult and juvenile toads had a 77 percent prevalence rate of infection (Jungwirth 2004, p. 54). Metamorphs often do not test positive at known Bd positive sites, and it is theorized that metamorphs may not have enough exposure time to the terrestrial environment to become infected with Bd (Jungwirth 2004, p. 54). Furthermore, at toad breeding sites tested through the 2007 field season, 22 breeding sites tested positive for Bd, 35 tested negative, and 22 additional sites were not tested (Jackson 2008, p. 6).

Even though Rocky Mountain National Park (RMNP) is one of the most protected environments within Colorado, boreal toad populations have declined in the park (Corn *et*

al. 1997, pp. 40, 42). Four sites were monitored in RMNP from 1990 to 2001, and significant declines of boreal toads were noted at two of the sites (Kettle Tarn and Lost Lake), although all sites declined (Muths *et al.* 2003, p. 5). Six adult toads that were suitable for histologic analysis all had Bd detected on them, and another four of six that had preliminary molecular analysis conducted on them were also determined to have Bd infections (Muths *et al.* 2003, p. 8). Based on analysis for other diseases, it was determined that Bd was the certain cause of decline (Muths *et al.* 2003, pp. 8–9). Evidence of the decline is supported by monitoring data showing that Lost Lake had 100–300 toads present from 1991 to 1998, but fell to 30 or fewer since then (Jackson 2008, p. 57). Kettle Tarn had a hundred or more toads from 1991 through 1995 but exhibited a similar precipitous decline afterwards (Jackson, 2008, p. 58).

Bd testing has not been conducted in the remaining population in southeastern Wyoming (Jackson 2008, p. 91). However, as with the rest of the SRM population, Bd is the suspected cause of declines in southeastern Wyoming (Jackson 2008, p. 4). As stated above, boreal toads were extirpated in New Mexico for many years, but reintroduced there in 2008 and 2009. However, in 2009 seven boreal toads from the 2008 release were recaptured, but six of the seven tested positive for Bd (NMDGF 2010, p. 3). This indicates that chytridiomycosis probably extirpated them in the past, and chance of survival of reintroduced toads is low. We currently have no information on Bd occurrence in southeastern Idaho, northeastern Nevada, or southwestern Wyoming. Overall, Bd appears to be widespread, and is known to occur in the SRM and Utah. Given its widespread distribution in the SRM area, Utah, and around the world, it is

likely present in the rest of the Eastern population and is almost assuredly the primary reason for declines observed in boreal toads in the Eastern population.

The fungal disease *Saprolegnia ferax* was spread to boreal toads from rainbow trout (*Oncorhynchus mykiss*) experimentally infected with *S. ferax* (Kiesecker *et al.* 2001, p. 1064). Although transmission of the disease from fish to boreal toads can occur, we have no information indicating that *S. ferax* is prevalent in the wild or has caused boreal toad declines in the wild.

We also have no information in our files to suggest that the trematode *Ribeiroia ondatrae* poses a threat to the boreal toad. The petitioners provided one article cited in the petition that found high frequencies (40-85 percent) of severe limb malformations in surviving western toads (*Anaxyrus boreas*) and decreased survivorship (42 percent) in toads with the heaviest treatment of trematodes in an induced laboratory experiment (Johnson *et al.* p. 370). However, effects of the trematode to wild boreal toads is not known, and the petition admits that further study is needed before any conclusions can be drawn on effects of the trematode to the boreal toad. Consequently, the petition did not present substantial information to suggest that the trematode may be a threat.

In conclusion, studies and information presented above illustrate that Bd may be the major factor in the decline of the boreal toad and that it poses a significant threat to the Eastern population of the boreal toad (Loeffler 2001, p. 13; Hogrefe *et al.* 2005, pp. 13–14). We find that the petition and information in our files present substantial

scientific or commercial information indicating that disease, specifically Bd resulting in chytridiomycosis, may be a threat to the Eastern population of the boreal toad.

Predation – The petition and information in our files show that adult boreal toads have several avian, mammalian, and reptilian predators (Olson 1989, entire; Hammerson 1999, p. 97; Livo 1999, p. 1). Avian, reptilian, insect, and even other amphibian predators of tadpoles and newly metamorphosed boreal toads also have been recorded (Beiswenger 1981, entire; Hammerson 1999, p. 98). Both garter snakes (*Thamnophis elegans*) and spotted sandpipers (*Actitis macularia*) are often encountered at boreal toad breeding sites in Colorado (Lambert 2003, pp. 22, 24, 77). At Brown's Creek in Colorado, garter snakes are suspected to be responsible for poor survivorship of boreal toad tadpoles (Lambert 2003, pp. 24, 77). It is likely that poor survivorship from predation occasionally results, but other than Lambert (2003, p. 22, 24, 77), we have no evidence that this occurs often enough or to an extent that it suppresses survival at breeding sites or breeding populations to a point that it may threaten the Eastern population of the boreal toad.

Nonnative predators, such as bullfrogs or stocked trout, were asserted by the petitioners to cause impacts to the boreal toad. We do not have any information that suggests that bullfrogs prey on boreal toads, since bullfrogs have never been documented in boreal toad habitat. Trout have been stocked in many lakes in the western United States, many of which were fishless prior to stocking (Bahls 1992, p. 183). The presence of stocked trout has been found to exclude frogs from lakes in the Sierra Nevada

Mountains (Bradford 1989, pp.776–777). However, laboratory experiments have indicated that American toad (*Bufo americanus*) tadpoles may be less palatable than chorus frog tadpoles (*Pseudacris triseriata*) to certain species of fish (Voris and Bacon 1966, p. 597) and we suspect that boreal toad tadpoles have similar toxins as the American toad. Additional evidence is that cutthroat trout (*Salmo clarkii*) mouthed then rejected boreal toad eggs that were fed to them (Licht 1969, p. 296). Although trout may injure boreal toad eggs or tadpoles by mouthing them, it appears that predation on boreal toads may be limited, due to the trout's avoidance of toxins in the eggs and tadpoles.

Localized predation from native or nonnative predators may sporadically occur and could occasionally cause declines or extirpation of breeding sites or breeding populations. However, we find that the petition and information in our files does not present substantial scientific or commercial information indicating that predation may rise to the level of a threat to the Eastern population of the boreal toad.

Summary for Factor C

Based on our evaluation, the petition and information in our files present substantial information that listing the Eastern population of the boreal toad due to disease may be warranted. Localized predation may cause effects to breeding sites or breeding populations, but the petition and information in our files do not present substantial information that listing the Eastern population due to predation may be

warranted. However, we will evaluate this factor more thoroughly during the 12-month status review if we determine that a valid DPS of boreal toad exists.

D. The Inadequacy of Existing Regulatory Mechanisms.

Information Provided in the Petition

The petition states that the boreal toad has been State-listed as endangered in Colorado and New Mexico (NMDGF 1988, p. 1; CDOW 1993, p. 2). The petition also states that the toads are designated as a State Sensitive Species in Utah. In Wyoming, the boreal toad is designated as a Native Species Status 1, which means the species and habitat are declining (McGee and Keinath 2004, p. 46). The petition states that the designations in Utah and Wyoming garner no legal or regulatory weight. The petition also states that boreal toads are designated as nongame species in Idaho, protecting them from collection. There is no designation for the boreal toad in Nevada.

The petition states that a Colorado recovery plan was completed in 1994, and a recovery plan for New Mexico was completed in 2006 (Nesler and Goettle 1994, entire; Pierce 2006, entire). The petition states that in Utah a conservation plan for the toad also has been completed (Hogrefe *et al.* 2005, entire). The petition adds that Idaho and Nevada do not have conservation plans for the boreal toad.

The petition states that the majority of boreal toad habitat in the Southern Rocky

Mountains is on U.S. Forest Service (USFS) land. The petition also points out that the USFS in both Region 2 (Colorado and southeast Wyoming) and Region 3 (New Mexico) classifies the toad as a sensitive species. However, USFS Region 4 (western Wyoming, southern Idaho, Nevada, and Utah) does not classify the toad as a sensitive species. The petition mentions that only two forests, the White River National Forest and Medicine Bow National Forest (in Colorado and Colorado/Wyoming, respectively), have forest plans that contain standards and guidelines for managing the boreal toad. However, the petition notes that the two forests only cover a small portion of the range of the toad and the forest plans do not adequately address all the threats to the toad. The petition also states that the Uintah National Forest, which covers a small area of the range of the Eastern population of the boreal toad, has a voluntary guideline to protect boreal toad habitat from disturbance (trampling) during the breeding season.

The BLM classifies the boreal toad as a sensitive species in Wyoming, Colorado, Utah, and Idaho. The petition points out that a State-led Boreal Toad Recovery Team comprised of State and Federal agencies, and an associated Technical Advisory Group comprised of university, State, Federal, and local government staff was formed and produced a conservation plan for the boreal toad in the Southern Rocky Mountains in 1998 (Loeffler 1998, entire) and revised the plan in 2001 (Loeffler 2001, entire).

The petition states that none of the State, USFS, or BLM classifications or recovery or conservation plans are adequate to protect the boreal toad, because they do not protect habitat, they carry no legal or regulatory weight, and they have not been

shown to have improved the status of the toad. For example, the petition states that the Utah Conservation Plan does not address all threats to the boreal toad, such as Bd, and Bd has been detected in toads in Utah. The petitioners also considered conservation agreements, and found the specified actions to be implemented by involved parties within the SRM conservation plan were vague and provided little protection to the boreal toad. The petition states that even if all actions in the SRM conservation plan were accomplished, it still would not adequately address the impacts of Bd on boreal toads.

Evaluation of Information Provided in the Petition and Available in Service Files

State listings in Colorado and New Mexico mean that possession of the boreal toads is prohibited. In Idaho, the nongame regulations prohibit possession of more than four boreal toads (Idaho Administration Procedures Act 2010, p. 4). The boreal toad was designated as a State Sensitive Species in Utah in 1997 (Hogrefe et al. 2005, p. 2). However, neither the Utah nor Wyoming sensitive species designations protect the toad from possession. Obviously, the lack of status in Nevada does not prevent possession of the toad there. However, we have no information on whether collection and possession of the boreal toad in any of the States is impacting the toad.

The Colorado Department of Parks and Wildlife (formerly Division of Wildlife), Wyoming Game and Fish, NMDGF, and UDWR have led or been instrumental in development of the State and SRM conservation plans, along with the USFS, U.S. Geological Survey, National Park Service, and BLM. Since the boreal toad was State

listed in Colorado, considerable effort and funding have gone towards research, management, captive breeding, and translocation or repatriation of boreal toads in Colorado, Wyoming, and New Mexico (the SRM population). University staff, the U.S. Geological Service, zoos, and others also have been instrumental in research into declines of the boreal toad and propagation of the toad.

Despite development of the conservation plans (which are voluntary and not regulatory in nature), and the designations by different State and Federal agencies, the research and management actions that have occurred, and the standards and guidelines put into place by the USFS, there has been little success in conserving the boreal toad because of the difficulty of arresting Bd-caused declines. However, the overwhelming factor in the boreal toad's decline is chytridiomycosis caused by Bd, which will likely affect the toads regardless of what regulatory protections are in place.

Summary for Factor D

Even though the Federal agencies have not addressed or implemented boreal toad management through all of their forest plans or resource management plans, they do have guidance through their sensitive species designations to manage for the toad. There have been management actions for the toad carried out on Federal lands, but the Service does not currently have information on the extent of implementation and effectiveness of these actions. The States within the Eastern population lack regulatory authority to protect the toad's habitat. However, as stated above in Factor A, we did not find substantial

information to show that habitat destruction, modification, or curtailment currently threaten the toad. Consequently, there is not substantial information to indicate that regulations protecting habitat are inadequate. Similarly, issues under Factors B, C, and E do not currently appear to need further regulatory mechanisms or would not be resolved by further regulatory mechanisms. Some of the States have regulations that prohibit or limit possession of boreal toads; however, there is no information to suggest that collection and possession of the boreal toad in any of the States is impacting the toad. Consequently, there is not substantial information to indicate that State regulations prohibiting collection and possession, or lack thereof, are inadequate.

Nonetheless, as both we and the petitioners recognize, Bd may be the overriding threat to the boreal toad, and we believe regulatory mechanisms are not capable or have limited capability to reduce the existing threat from Bd. Based on our evaluation, neither the petition nor information in our files presents substantial information that listing the Eastern population of boreal toad due to inadequacy of existing regulatory mechanisms may be warranted. However, we will evaluate this factor more thoroughly during the 12-month status review if we determine that a valid DPS of boreal toad exists.

E. Other Natural or Manmade Factors Affecting Its Continued Existence.

Information Provided in the Petition

Isolation – The petition states that many populations of boreal toad are small and

isolated (Hogrefe *et al.* 2005, p. 15). Isolation and small population size can preclude genetic interchange and recolonization of habitat in the face of impacts such as Bd or long-term land management changes (Carey *et al.* 2005, pp. 235, 236). Lack of gene flow also may cause loss of genetic variability (Wright 1931, pp. 98-102), causing inbreeding depression. The petition states that random events, environmental factors, or human impacts may cause extirpation of small, isolated populations.

Climate Change – The petition states that since boreal toads are ectotherms (require heat from the sun or outside sources to warm selves), their body temperature varies with their surroundings. The petition states (?) boreal toad reproductive behavior and boreal toad abundance may be affected by temperature changes resulting from climate change (Blaustein and Wake 1995, pp. 2–4; Blaustein *et al.* 2001, p. 1808). The petition also states that warmer temperatures may allow for the spread of disease, especially in higher elevations where currently disease may not be as prevalent. The petition states drought and early or late season freezing temperatures caused by climate change may dry up breeding pools and cause mortality before or after hibernation (McGee and Keinath 2004, p. 41). The petition states that warming will limit activity of toads in different habitats (Bartelt *et al.* 2010, p. 2675). The petition also states that effects of climate change may have already been observed through increasingly earlier breeding due to warmer temperatures or reduced precipitation (Blaustein *et al.* 2001, p. 1806; Corn 2003, p. 624).

Ultraviolet Radiation –The petition states that degradation of the ozone may be

causing increases in ultraviolet-B (UV-B) radiation (Stolarski *et al.* 1992, p. 342; Blumthaler *et al.* 1997, p. 130). The petition states the boreal toad may be susceptible to UV-B radiation due to not having protective hair or feathers, and not having protective shells on their eggs, which are laid in shallow water (Blaustein *et al.* 1994, p. 1791; Corn 1998, p. 19). Additionally, the petition states that photolyase, an enzyme that repairs UV-B damage, is lower in boreal toads than in some frogs and may cause lower hatching success in boreal toads (Blaustein *et al.* 1994, p. 1794). However, the petition also acknowledges that some studies show UV-B radiation is not a factor in hatching success of red-legged frogs (*Rana aurora*) or boreal toads (Blaustein *et al.* 1996, p. 1401; Corn 1998, pp. 22–23; Loeffler 2001, p. 12).

Invasive Species – The petition discusses invasive species under Factor E, but since the discussion focuses on disease transmission and predation by invasive species, we address this under Factor C, *Disease or Predation*, above.

Evaluation of Information Provided in the Petition and Available in Service Files

Isolation – Isolation or small population size could cause extirpation of boreal toad breeding colonies through habitat loss or fragmentation or other human or environmental factors (such as Bd infection), random events, or genetic problems. Microsatellite nDNA analysis suggests that populations of boreal toads within the Eastern population are isolated from one another, with little gene flow, and that this could potentially cause genetic problems (Switzer *et al.* 2009, pp. 23, 25). Additional

information suggests that boreal toad populations in Utah are separated from each other due to long-term climate change (over the last 10,000 years) and human development at lower elevations resulting in genetic problems or loss of smaller populations through random events (Hogrefe *et al.* 2005, pp. 14–15).

Diseases, such as chytridiomycosis, which is caused by Bd, also could cause extirpation of these small populations. The SRM conservation plan gives a general idea of a large “population” in the viability criteria as 20 or more adult toads in a breeding “locality” (in this context “locality” is the same as a breeding population). Monitoring in Colorado and southeastern Wyoming in 2009 revealed that only 5 out of 47 breeding populations (11 percent), or 8 breeding sites out of 73 (about 9 percent), had more than 20 adults (CDOW 2010, entire). These statistics illustrate that very few populations in the SRM portion of the Eastern population are large. Consequently, we determine that the petition and information in our files present substantial scientific or commercial information indicating that isolation and small population size may be a threat to the Eastern population of the boreal toad.

Climate Change – Ray *et al.* (2008, p. 1) predict that Colorado will warm by about 1 °C (2.5 °F) by 2025 and by about 2 °C (4.0 °F) by 2050. Most of the observed snowpack loss in Colorado has occurred below 2,500 m (8,200 ft), with snowpack loss above this elevation predicted at between 10 and 20 percent (Ray *et al.* 2008, p. 2). With the range of the boreal toad largely above 2,500 m (8,200 ft) in the southern Rocky Mountains, it is likely that they will be shielded from extensive droughts. However,

some drought effects were noted in boreal toads in the southern Rocky Mountains in 2002 during a drought cycle (Livo and Loeffler 2003, p. 11). Several breeding sites either remained dry throughout the breeding season or dried up prior to metamorphosis, reducing toad abundance. However, based on subsequent years with more precipitation, the 2002 drought may have been within normal variation and not related to climate change. Drought could exacerbate the decline of localized boreal toad populations, but is not considered a major factor in the widespread decline of the species.

There is a possibility that some diseases, such as chytridiomycosis, could expand their range into higher elevation boreal toad habitats if warmer temperatures occur due to climate change. However, references on this subject listed in the petition are not currently available to us and we have no information in our files to support this hypothesis. Warming temperatures could affect evaporative water loss from boreal toads, which could affect toad movement, breeding, and genetic interchange (Bartelt *et al.* 2010, p. 2675). Conversely, warmer temperatures could potentially help boreal toads by lengthening the growing season and increasing the rate of growth, leading to earlier metamorphosis and greater survival (Carey *et al.* 2005, p. 236). We find that the petition and information in our files does not present substantial scientific or commercial information indicating that climate change may be a threat to the Eastern population of the boreal toad.

Ultraviolet Radiation –The effect of increased UV-B radiation resulting from ozone depletion has been implicated as a contributing factor in amphibian declines,

particularly on species inhabiting mountainous regions. However, studies are conflicting as to whether UV-B radiation has any effect on boreal toads and other frog species. A correlation was demonstrated between increased levels of UV-B and amphibian mortality in boreal toads and the Cascades frog (*Rana cascadae*), but there was no effect of ambient UV-B radiation on red-legged frog (*R. aurora*) hatching success (Blaustein *et al.* 1994, pp. 1791, 1793–1794). No evidence linking UV-B levels to the decline of the boreal toad was found in another study (Corn 1998, pp. 18, 21–25). Another study suggested that UV-B and pH could have synergistic effects on embryonic success (Long *et al.* 1995, entire). However, as stated in the “Pollutants” section under Factor A, pH does not appear to be an issue for boreal toads, and, consequently, the synergistic effects of UV-B and pH on boreal toads are not expected to occur in the wild. Therefore, we determine that the petition and information in our files do not present substantial scientific or commercial information indicating that UV-B radiation may be a threat to the Eastern population of the boreal toad.

Summary for Factor E

Based on our evaluation, the petition and information in our files present substantial information that listing the Eastern population of the boreal toad due to isolation and small population size may be warranted. Based on our evaluation, neither the petition nor information in our files presents substantial information that listing the Eastern population of the boreal toad due to climate change or UV-B radiation may be warranted. However, we will evaluate the potential threat of climate change and UV-B

radiation more thoroughly during the 12-month status review if we determine that a valid DPS of boreal toad exists.

Finding

On the basis of our determination under section 4(b)(3)(A) of the Act, we determine that the petition presents substantial scientific or commercial information indicating that listing the Eastern population of the boreal toad as a DPS may be warranted. This finding is based on information provided under Factors C and E.

Because we have found that the petition presents substantial information indicating that listing the Eastern population of the boreal toad as a DPS may be warranted, we are initiating a status review to determine whether listing the Eastern population of the boreal toad under the Act is warranted. During the status review, we will fully address the cumulative effects of threats discussed under each factor. Additionally, if during the status review period the Eastern population of the boreal toad is classified as its own species, the Service will determine if listing the newly classified species is warranted.

The “substantial information” standard for a 90-day finding differs from the Act’s “best scientific and commercial data” standard that applies to a status review to determine whether a petitioned action is warranted. A 90-day finding does not constitute a status review under the Act. In a 12-month finding, we will determine whether a petitioned

action is warranted after we have completed a thorough status review of the species, which is conducted following a substantial 90-day finding. Because the Act's standards for 90-day and 12-month findings are different, as described above, a substantial 90-day finding does not mean that the 12-month finding will result in a warranted finding.

References Cited

A complete list of references cited is available on the Internet at <http://www.regulations.gov> and upon request from the Western Colorado Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Author

The primary authors of this notice are the staff members of the Colorado Field Office in Grand Junction and Lakewood, Colorado.

Authority

The authority for this action is the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Date: March 27, 2012

Rowan W. Gould

Acting Director, U.S. Fish and Wildlife Service

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